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# THE MILITARY EFFECTIVENESS OF NAVY AIRMEN ENLISTEES

REPORT NUMBER: 69-25



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NEUROPSYCHIATRIC RESEARCH UNIT

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SAN DIEGO, CALIFORNIA 92152

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WASHINGTON, D. C. 20390

THE MILITARY EFFECTIVENESS OF NAVY AIRMEN ENLISTEES

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## Introduction<sup>1,2,3</sup>

During the past decade the Navy's Neuropsychiatric Research Unit has conducted a series of longitudinal studies of the military effectiveness of Navy enlisted personnel (Plag, 1964; Plag and Goffman, 1966a; Plag and Goffman, 1966b; Plag and Goffman, 1966c; Plag and Goffman, 1968). These studies have yielded findings regarding the incidence of non-effectiveness and have been successful in identifying some personal history and early training characteristics of enlistees which are related to their military adaptations during the four years of active duty comprising their first enlistments.

The findings from these studies have made it possible to derive formulae which are useful for predicting enlistee effectiveness. Sailors are considered to have rendered effective military service if they complete their tours of obligated duty and are recommended for reenlistment by their commanding officers. Non-effective sailors are those discharged prior to completion of their tours of active duty and ones completing their tours with performances so poor that they are not recommended for reenlistment. The accuracy with which effectiveness predictions can be made are quite modest. In a general sense, the goal of additional studies in the area of enlistee effectiveness is to improve the accuracy with which forecasts can be made.

More specifically, the studies of enlistee effectiveness which have been conducted to date have concentrated upon identifying valid predictor composites. In other words, the focus in these studies has been upon the predictor aspects of the predictor-criterion equation, not upon refinements in the effectiveness criterion itself. An evaluation of criterion reliability, measurement innovations aimed at increasing criterion variability, and an assessment of the value of criterion moderators are examples of criterion studies needed in the area of enlistee-effectiveness research. This report is of one study designed to evaluate what moderating effect, if any, enlistee membership in a specific group might have upon the validity of effectiveness predictions.

The physical and psychological environments in which enlistees serve in the

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fleet are extremely varied. It would seem reasonable, therefore, to hypothesize the existence of differential rates of effectiveness as a function of different service environments. It is also quite possible that those variables which are predictive of effectiveness for all enlistees together are different from those which are most valid for predicting effectiveness for enlistees assigned to a specific fleet environment.

There are several different bases upon which fleet environments can be categorized. In this study, groupings were made on the basis of broad occupational fields which comprise the enlisted rating structure. In addition to the general rates, NAVPERS 18068B defines twelve occupational groups: (1) Deck, (2) Ordnance, (3) Electronics, (4) Precision Equipment, (5) Administrative and Clerical, (6) Miscellaneous, (7) Engineering and Hull, (8) Construction, (9) Aviation, (10) Medical, (11) Dental, and (12) Steward. Group IX - Aviation, and enlistees in the general rating of Airman (AN), constituted the group selected for this study.

In addition to the general purpose of the study, as outlined in the foregoing paragraphs, the specific plan of the investigation included a comparison of airmen and non-airmen on the basis of (a) personal history characteristics, (b) percentages and types of service non-effectiveness, (c) percentage of personnel reenlisted, and (d) percentage of personnel assigned to Class A service schools following graduation from recruit training. A determination was also made of the number of airmen who originally enlisted in the Navy in airmen ratings, and a sampling was made of the types and number of duty stations to which airmen are assigned during their first enlistments. Finally, equations were derived for predicting the service effectiveness of airmen and non-airmen groups separately, and a comparison was made of the validities of these independent predictions.

#### The Research Data

Subjects for this study consisted of enlistees who began their tours of active duty at the two Naval Training Centers at Great Lakes and San Diego during four sampling periods in May, August, and November 1960 and February 1961. Aviation personnel were defined as those recruit training graduates assigned to the following ratings:

- (1) Airman (AN)
- (2) Aerographer's Mate (AG)
- (3) Air Controlman (AC)
- (4) Aviation Antisubmarine Warfare Operator (AW)
- (5) Aviation Antisubmarine Warfare Technician (AX)
- (6) Aviation Boatswain's Mate (AB)
- (7) Aviation Electrician's Mate (AE)

- (8) Aviation Electronics Technician (AT)
- (9) Aviation Fire Control Technician (AQ)
- (10) Aviation Machinist's Mate (AD)
- (11) Aviation Maintenance Administrationman (AZ)
- (12) Aviation Ordnanceman (AO)
- (13) Aviation Storekeeper (AK)
- (14) Aviation Structural Mechanic (AM)
- (15) Aviation Support Equipment Technician (AS)
- (16) Aircrew Survival Equipmentman (PR)
- (17) Photographer's Mate (PH)
- (18) Photographic Intelligenceman (PT)
- (19) Tradesman (TD)

Non-airmen consisted of those recruit training graduates assigned to ratings other than the nineteen listed above.

Biographical data for the sample subjects were obtained from a psychiatric screening questionnaire which is routinely administered to enlisted personnel during their first day in recruit training. These data consisted of the following variables:

- (1) Age at enlistment
- (2) Years of formal education completed
- (3) Number of arrests - for reasons other than traffic violations
- (4) Family stability - the marital status of parents at the time of sailor's enlistment
- (5) Number of school grades failed or repeated
- (6) Number of expulsions or suspensions from school
- (7) Average grade received in school
- (8) Age upon leaving school
- (9) Period of active duty obligation
- (10) Number of siblings
- (11) History of prior service rejection
- (12) Marital status
- (13) History of previous service
- (14) Religion
- (15) Race

Subjects' scores on five tests of cognitive ability were obtained from records maintained by the classification departments at the two naval training centers. These tests were:

- (1) Armed Forces Qualification Test (AFQT) - a test of mental ability administered to all applicants for service induction and enlistment

at the Armed Forces Examining and Entrance Stations

- (2) General Classification Test (GCT) - a 100-item Navy test of verbal aptitude
- (3) Arithmetic Test (ARI) - a 50-item Navy test of the ability to perform elementary computations and solve quantitative problems
- (4) Mechanical Test (MECH) - a 100-item Navy test of mechanical comprehension and tool knowledge
- (5) Clerical Test (CLER) - a 210-item Navy speeded test of number matching

Data pertaining to the adjustment and performance of enlistees during recruit training were obtained from files maintained by the training offices of each of the two recruit training commands. These data were the following:

- (1) Number of recruit training transfers - because of performance deficiencies or because of physical illness, recruits may be set back in training or transferred to other training companies. This variable was a measure of the number of times recruits were transferred from one training unit to another.
- (2) Company commander rating of performance - a three-category scale (best ten recruits, average recruits, worst ten recruits) of overall training performance as evaluated by company commanders at the termination of training. Only those subjects who completed training with their originally assigned companies received a score on this variable. In the data analyses, therefore, recruit training variables 1 and 2 were combined and treated as a single predictor.
- (3) Average weekly test grade - an average of the scores received by recruits on weekly tests measuring knowledge of classroom subjects taught during training
- (4) Recruit final achievement test score (RFATS) - a score based upon a final examination covering subjects taught during recruit training
- (5) Recruit disciplinary status - a variable specifying various types of disciplinary action at the regimental level during training

Throughout the period from 1960 through 1965, the record (Enlisted Master Tape) of active duty enlistees, maintained by the Bureau of Naval Personnel, was examined periodically in order to construct a history of the commands to which the sample subjects had been attached. In addition, the Enlisted Master Tape served as a source of information for determining which subjects had failed to complete their active duty obligations. For those personnel who did not extend their enlistments beyond the first, data pertaining to the cause of separation, the periods of duty served, and commanding officer recommendations for reenlistment were obtained from

#### Results

Sample: The total research sample numbered 11,008 sailors. Of this group, 639 personnel were separated from service while attached to recruit training commands. Of the 10,369 subjects who graduated from recruit training, 2358 were assigned to aviation ratings, while the remaining 8011 enlistees were assigned to other-than-aviation specialties. It is interesting to note that of the 2358 aviation personnel, 1153 (48.88 percent) entered recruit training already classified as airmen (AR=590,AA=553,AN=10). The remainder (1205) were assigned to aviation specialties at the time of classification processing in recruit training.

Effectiveness: Military effectiveness has been defined as the completion of obligated duty with a recommendation for reenlistment. Non-effectiveness refers to unsatisfactory performance as evidenced by service separation prior to the completion of obligated duty or failure to be recommended for reenlistment. A small, but statistically significant difference was found in the rate of military effectiveness between the airmen and non-airmen groups. For the airmen, 78.91 percent were found to have rendered effective service, while for non-airmen the percentage was 76.85.

Table 1 shows the number of subjects in the two groups who rendered various types of non-effective service. These data may be summarized as follows:

- (1) Airmen have a higher rate of military effectiveness than non-airmen.
- (2) Some subjects in both groups render performances which, because of service incurred physical disability or death, can be categorized as neither effective nor non-effective. There is no significant difference between the airmen and non-airmen groups on this basis.
- (3) Of those subjects who render non-effective performances, there is no significant difference between the airmen and non-airmen groups in the percentage who receive early separations versus the percentage who complete their tours but are not recommended for reenlistment.
- (4) Of those personnel who render non-effective performances as evidenced by early service separation, significant differences exist between airmen and non-airmen on the basis of the type of discharge received. Airmen receive a significantly larger number of punitive discharges and a significantly smaller number of unsuitability discharges than non-airmen.

Reenlistment: Only those personnel who complete their periods of active obligated duty and are recommended for reenlistment by their commanding officers are eligible for a second enlistment. For the airmen group, the number eligible for reenlistment was 1830, while for the non-airmen the number was 6052. Airmen reen-

Table 1

Numbers of Airmen and Non-Airmen Rendering Various Types of Non-Effective Service

| Category  | Airmen |         | Non-Airmen |         | Difference                 |
|---|--------|---------|------------|---------|----------------------------|
|   | No.    | Percent | No.        | Percent |                            |
| I. Total subjects                                       | 2358   | 100.00  | 8011       | 100.00  | $\chi^2=0.002$             |
| A. Missing data   | 11     | 0.47    | 38         | 0.47    | df=1                       |
| B. Complete data  | 2347   | 99.53   | 7973       | 99.53   | p=Not Signif.              |
| II. Subjects-complete data                              | 2347   | 100.00  | 7973       | 100.00  | $\chi^2=0.020$             |
| A. Effective or non-effective                           | 2319   | 98.81   | 7875       | 98.77   | df=1                       |
| B. Neither effective nor non-effective                  | 28     | 1.19    | 98         | 1.23    | p=Not Signif.              |
| 1. Service incurred physical disability                 | 13     |         | 69         |         |                            |
| 2. Death  | 15     |         | 29         |         |                            |
| III. Subjects effective or non-effective                | 2319   | 100.00  | 7875       | 100.00  | $\chi^2=4.346$             |
| A. Effective-completed tour, recomm. for reenlist.      | 1830   | 78.91   | 6052       | 76.85   | df=1                       |
| B. Non-effective  | 489    | 21.09   | 1823       | 23.15   | p=.04                      |
| IV. Subjects non-effective                              | 489    | 100.00  | 1823       | 100.00  | $\chi^2=0.964$             |
| A. Early separation                                     | 325    | 66.46   | 1254       | 68.79   | df=1                       |
| B. Completed tour but not recomm. for reenlist.         | 164    | 33.54   | 569        | 31.21   | p=Not Signif.              |
| V. Subjects non-effective by reason of early separation | 325    | 100.00  | 1254       | 100.00  |                            |
| A. Medical (EPTE) <sup>a</sup>                          | 31     | 9.54    | 99         | 7.89    | $\chi^2=0.922$ ;df=1;N.S.  |
| B. Unsuitability  | 73     | 22.46   | 373        | 29.74   | $\chi^2=6.756$ ;df=1;p<.01 |
| C. Unfitness  | 86     | 26.46   | 377        | 30.06   | $\chi^2=1.617$ ;df=1;N.S.  |
| D. Punitive   | 73     | 22.46   | 209        | 16.67   | $\chi^2=5.911$ ;df=1;p=.02 |
| E. Administrative (C.O.G.) <sup>b</sup>                 | 62     | 19.08   | 196        | 15.63   | $\chi^2=2.245$ ;df=1;N.S.  |

<sup>a</sup>Existed prior to service entry<sup>b</sup>Convenience of Government

listees numbered 378, or 20.66 percent of those eligible. In the non-airmen group, 1293 personnel (21.36 percent) reenlisted. The difference between the two groups in reenlistment rate is not statistically significant ( $\chi^2=0.423$ ; df=1; p=N.S.).

School Attendance: There was no significant difference between the percentage of airmen and the percentage of non-airmen who attended a Class A service school following graduation from recruit training. 38.53 percent of the airmen and 38.38 percent of the non-airmen attended Class A schools.

Career History: As an example of the types of commands to which airmen are attached during their first enlistment, a sub-sample of twenty subjects was randomly selected from the airmen group and a listing made of their duty stations and the time spent at each. Rate changes during the course of the first enlistment were also noted for each subject. The career histories of these airmen are shown in Table 2.



Table 2

## The Career Histories of a Sample of Twenty Airmen

| <u>Subject</u> | <u>Successive Duty Stations<sup>a</sup></u>   | <u>Time Attached<br/>(in days)</u> | <u>Rate<br/>Progression<sup>b</sup></u> |
|----------------|---|------------------------------------|---|
| 1              | School, NATTU, JACKSONVILLE<br>Naval Station, KEFLAVIK<br>VAW 12                              | 234<br>362<br>429                  | AA, AEAA,<br>AEAN,<br>AE3               |
| 2              | NATTU, PENSACOLA<br>Discharged, BuPers Code 368,<br>Unsuitability, Anti-social<br>Personality | 289                                | AA,AR                                   |
| 3              | NAAS, KINGSTON, TEX.<br>VAH 1   | 713<br>517                         | AA,AR,<br>AA                            |
| 4              | CVA 59, FORRESTAL   | 1301                               | AA,AN,<br>ABH3                          |
| 5              | School, NATTC, MEMPHIS<br>NAF, MONTEREY   | 119<br>1217                        | AA,ADJAN,<br>ADJ3                       |
| 6              | AIRMAINT TRAGRP<br>VS 30<br>VS 36   | 916<br>30<br>386                   | AA,AN,<br>ADR3,<br>ADR2                 |
| 7              | TRARON 6<br>TRARON 3<br>NAS, MAYPORT, FLA.<br>RS, NORFOLK, VA,                                | 521<br>256<br>31<br>243            | AA,<br>AN,<br>AA                        |
| 8              | School, NATTC, MEMPHIS<br>AEW, BARRONPAC<br>VW 1<br>VA 125<br>VA 153                          | 254<br>104<br>412<br>69<br>363     | AA,<br>ATРАН,<br>ATR3                   |
| 9              | NAS, NORFOLK<br>CVA 34, ORISKANY  | 737<br>543                         | AA,AN,<br>ADR3, ADRAN                   |
| 10             | MISSLCEN, PT.MAGU<br>PMA NAS, PT. MAGU<br>NSD, GUAM   | 291<br>457<br>596                  | AA,AN,<br>AKAN,<br>AK3                  |
| 11             | School, NATTC, MEMPHIS<br>VS 32   | 321<br>773                         | AA,AN,<br>ATSAN,ATS3,<br>AX3,AX2        |
| 12             | CVS 11, INTREPID<br>LPH7, GUADALCANAL   | 858<br>554                         | AA,AN,<br>ADR3,ADРАН                    |
| 13             | NAS, LEMOORE<br>Discharged, BuPers Code 28F,<br>Unfitness,Failure to pay debts                | 558                                | AA,AN                                   |
| 14             | School, TRADEV CTR, PENSACOLA<br>VU 7   | 250<br>1063                        | AA,YAEAN,<br>AE3                        |
| 15             | TRARON 6<br>School, NATTC, MEMPHIS<br>VA 165  | 149<br>129<br>1158                 | AA,AN,<br>AMEAN,<br>AME3,AME2           |

<sup>a</sup>For each subject, duty stations are listed in order - from recruit training graduation to completion of enlistment.

<sup>b</sup>Rate progression is the order in which rates were held by each subject from recruit training graduation until the end of the enlistment. They do not correspond in time to the subject's duty stations.

Table 2 (Continued)

| <u>Subject</u> | <u>Successive Duty Stations<sup>a</sup></u>  | <u>Time Attached<br/>(in days)</u> | <u>Rate<br/>Progression<sup>b</sup></u>  |
|----------------|--|------------------------------------|--|
| 16             | NAF, MONTEREY<br>CVS 33, KEARSARGE   | 663<br>316                         | AA,<br>AN                                |
| 17             | School, NATTC, MEMPHIS<br>NS, ARGENTIA<br>VAW 33   | 170<br>619<br>465                  | AA,<br>ADRAN,<br>ADR3                    |
| 18             | PAC MISSILE RANGE<br>CVA 41, MIDWAY  | 723<br>612                         | AA,AR,<br>AA,AN                          |
| 19             | AV 13, SALISBURY<br>Discharged, BuPers Code 28B,<br>Unfitness, Discreditable<br>Involvement with Civilian or<br>Military Authorities | 389                                | AA,AN                                    |
| 20             | School, NATTC, MEMPHIS<br>NS, SAN DIEGO<br>VAP 61<br>VAH 123<br>VAH 8  | 151<br>27<br>543<br>49<br>533      | AA,<br>AMHAA,<br>AMHAN,<br>AMH3,<br>AMH2 |

Although data for only twenty subjects may be quite unreliable, the information contained in Table 2 suggests that airmen who complete their first enlistments are attached to an average of 2.7 commands. The average number of days spent at each duty station is 461. For those subjects who attend a service school, an average of 204 days is spent in the classroom during the enlistment. For the subjects in this sample who completed their enlistments, the average number of days spent on active duty from the time of graduation from recruit training until termination of their obligation was 1249 days.

Personal History Characteristics: Airmen and non-airmen were compared on the basis of fifteen personal history characteristics and five tests of cognitive ability. Statistically significant differences were found between the airmen and non-airmen groups on nine of these variables. Table 3 depicts these variables and the differences found between the groups. On the basis of these data, airmen may be described as possessing higher average intelligence than non-airmen and as having a higher percentage of their members belonging to the Caucasian-Protestant group of enlistees. More airmen than non-airmen give a history of prior military service which is consistent with the finding that 48.88 percent of the aviation personnel entered recruit training already classified as airmen.

Prediction of Effectiveness: The variables which were analyzed for use in predicting service effectiveness were those listed in "The Research Data" section of this report. They consisted of fifteen biographical characteristics, five tests of cognitive ability, and four measures of recruit training performance.

Table 3  
Personal History Characteristics and Tests of Cognitive  
Ability on which Airmen and Non-Airmen are  
Significantly Different

| <u>Part I - Continuous Variables</u>                 |                            |                                |                   |
|--|----------------------------|--------------------------------|-------------------|
| <u>Variable</u>                                      | <u>Mean for<br/>Airmen</u> | <u>Mean for<br/>Non-Airmen</u> | <u>Difference</u> |
| 1. Number of Siblings                                | 3.119                      | 3.250                          | t=2.60;p<.01      |
| 2. AFQT Score<br>(Navy Standard Score<br>Equivalent) | 52.55                      | 51.17                          | t=7.56;p<.001     |
| 3. GCT Score   | 51.91                      | 50.82                          | t=5.13;p<.001     |
| 4. ARI Score   | 50.86                      | 50.34                          | t=2.89;p<.01      |
| 5. MECH Score  | 51.44                      | 49.67                          | t=9.77;p<.001     |

| <u>Part II - Discrete Variables</u> |                              |                                  |                   |
|-------------------------------------|------------------------------|----------------------------------|-------------------|
| <u>Variable</u>                     | <u>Percent of<br/>Airmen</u> | <u>Percent of<br/>Non-Airmen</u> | <u>Difference</u> |
| 6. Marital Status                   |                              |                                  | $\chi^2=5.58$     |
| a. Single                           | 96.18                        | 97.14                            | df=1              |
| b. Other                            | 3.82                         | 2.86                             | p=.02             |
| 7. Previous Service                 |                              |                                  | $\chi^2=11.99$    |
| a. None                             | 90.83                        | 93.04                            | df=1              |
| b. Some                             | 9.17                         | 6.96                             | p<.001            |
| 8. Religion                         |                              |                                  | $\chi^2=5.96$     |
| a. Protestant                       | 71.33                        | 68.82                            | df=2              |
| b. Catholic                         | 27.30                        | 29.45                            | p=.05             |
| c. Other                            | 1.37                         | 1.73                             |                   |
| 9. Race                             |                              |                                  | $\chi^2=9.29$     |
| a. Caucasian                        | 96.09                        | 94.51                            | df=1              |
| b. Other                            | 3.91                         | 5.49                             | p<.01             |

Two equations were derived for the prediction of effectiveness, one for the airmen group and one for the non-airmen group. For the purpose of obtaining an estimate of the predictive validity of the derived equations, each of the enlistee groups was divided into a validation and cross-validation sample. The validation and cross-validation samples were selected in such a way that the percentages of effective and non-effective enlistees in the two samples were identical.

For each group (airmen and non-airmen), the predictor data from the validation sample were analyzed to determine the linearity of the predictor-criterion relationships and for the purpose of assigning appropriate weights to the various segments of the discrete variables. Pearson product-moment correlations were then calculated between all variables, and a stepwise linear multiple regression proce-

cedure was utilized for deriving the prediction equation for each of the subject groups. In each case, the optimum prediction equation which was derived was one in which all the beta weights of the independent variables were significant at or beyond the .05 level of confidence. The derived equation for each group was then applied to the cross-validation sample and predicted criterion scores calculated for each subject. These scores, from the cross-validation sample, were then correlated with the effectiveness criterion and the resulting Pearson r interpreted as representing the predictive validity of the aggregate of enlistee characteristics.

Of the 2319 airmen for whom effectiveness data were available, 1160 were assigned to the validation sample and 1159 to the cross-validation sample. For both samples, the percentage of effectiveness was 78.91.

Of the 24 predictor variables which were analyzed in the airmen validation sample, only 17 yielded correlations significantly related to the effectiveness criterion. Those yielding insignificant correlations were: (1) Family stability, (2) Number of siblings, (3) History of previous service, (4) History of prior service rejection, (5) Marital status, (6) Religion, and (7) Race. These seven variables were omitted from the multiple regression analysis.

The correlations of the 17 valid predictors and the criterion are shown in Table 4. It will be noted in Table 4 that all the predictor validities are positive, even though some of the variables obviously bear a negative relationship to military effectiveness (e.g., school grades failed). This situation occurs because of the linearization weights which were assigned to the segments of some of the variables--ones which otherwise would not be linearly related to the criterion. Actually, the weights assigned to the various segments of each variable are the criterion means for the subjects comprising the variable categories. Enlistees rendering effective service were assigned a value of "1" on the criterion variable, while those who were non-effective were assigned a value of "0".

An example may serve to illustrate the weighting procedure. The "school grades failed" variable was represented in three segments: none, one, and two or more. The criterion means for subjects in these categories were found to be .844, .746, and .648, respectively. In other words, 84.4 percent of airmen in the validation sample who failed no grades were effective, while 74.6 percent and 64.8 percent of airmen who failed one and two or more grades, respectively, were effective. Table 5 shows the weights assigned to the various segments of the predictor variables for the airmen group.

The number of non-airmen who were either effective or non-effective was 7875. Of these, 3937 comprised the validation sample and the cross-validation sample numbered 3938.

Table 4a,b

Product-Moment Correlations of Predictors Significantly Related to Military Effectiveness - Airmen

Group - Validation Sample (N=1160)

| Variables                          | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9    | 10   | 11   | 12  | 13  | 14  | 15   | 16  | 17  |
|------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|-----|-----|------|-----|-----|
| 1. Effectiveness                   | 113 |     |     |     |     |     |     |     |      |      |      |     |     |     |      |     |     |
| 2. Age                             | 149 | 669 |     |     |     |     |     |     |      |      |      |     |     |     |      |     |     |
| 3. Active Duty Ob.                 | 275 | 376 | 401 |     |     |     |     |     |      |      |      |     |     |     |      |     |     |
| 4. Education                       | 164 | 122 | 098 | 476 |     |     |     |     |      |      |      |     |     |     |      |     |     |
| 5. School Grds. Failed             | 145 | 118 | 160 | 274 | 185 |     |     |     |      |      |      |     |     |     |      |     |     |
| 6. School Grade Av.                | 193 | 432 | 489 | 633 | 125 | 171 |     |     |      |      |      |     |     |     |      |     |     |
| 7. Age left School                 | 164 | 173 | 151 | 206 | 111 | 120 | 157 |     |      |      |      |     |     |     |      |     |     |
| 8. No. Expulsions                  | 134 | 084 | 096 | 192 | 058 | 086 | 163 | 259 |      |      |      |     |     |     |      |     |     |
| 9. No. Arrests                     | 179 | 145 | 073 | 320 | 255 | 210 | 169 | 049 | 057  |      |      |     |     |     |      |     |     |
| 10. AFQT                           | 182 | 121 | 030 | 380 | 296 | 200 | 201 | 030 | 042  | 653  |      |     |     |     |      |     |     |
| 11. GCI                            | 226 | 099 | 057 | 393 | 285 | 329 | 215 | 061 | 068  | 573  | 594  |     |     |     |      |     |     |
| 12. ARI                            | 092 | 141 | 010 | 135 | 124 | 039 | 114 | 060 | 040  | 544  | 386  | 239 |     |     |      |     |     |
| 13. MECH                           | 151 | 102 | 067 | 245 | 154 | 146 | 129 | 115 | 043  | 147  | 144  | 291 | 058 |     |      |     |     |
| 14. CLER                           | 256 | 171 | 123 | 238 | 163 | 136 | 157 | 138 | 048  | 138  | 147  | 154 | 122 | 152 |      |     |     |
| 15. R.T. Transfers-<br>C.C. Rating | 214 | 156 | 091 | 369 | 288 | 201 | 187 | 044 | 045  | 510  | 629  | 484 | 345 | 231 | 231  |     |     |
| 16. Aver. Weekly<br>Test Grade     | 143 | 145 | 034 | 246 | 264 | 091 | 126 | 004 | -036 | 457  | 509  | 337 | 375 | 121 | 106  | 511 |     |
| 17. RFATS                          | 092 | 021 | 004 | 055 | 035 | 004 | 045 | 085 | 059  | -004 | -024 | 024 | 040 | 080 | .350 | 044 | 001 |
| 18. R. Discipline<br>Status        |     |     |     |     |     |     |     |     |      |      |      |     |     |     |      |     |     |

<sup>a</sup>Decimal points have been omitted from the correlations.<sup>b</sup>Many of the predictor variables were linearized with the effectiveness criterion. Hence, the validities of all the predictors are positive. Refer to Table 5 for the linearization weights assigned to the segments of some of the variables.

Those variables (17 in number) found to be significantly related to effectiveness for airmen were also found to possess significant validities for non-airmen. As with the airmen group, seven of the variables yielded insignificant correlations.

Table 6 shows the correlations of the significant predictors and the criterion for the non-airmen. As in the case of the airmen, some of the predictors were found to possess non-linear relationships with the effectiveness criterion. The weights which were applied to the segments of these variables are shown in Table 7.

The multiple regression analysis of the airmen data identified six variables which added uniquely to the prediction of effectiveness. Arithmetic score, Recruit training transfers - Company commander rating, Education, Expulsions, Arrests, and Average weekly test score were the variables whose beta weights were found to be significant at or beyond the .05 level of confidence. This predictor composite yielded a multiple correlation (in the validation sample) of .379. The cross-validity of the prediction equation was .328, with a standard error of estimate of .3854.

For the non-airmen group, eight variables were identified as the predictor composite. These were Mechanical score, Clerical score, Recruit discipline status, Recruit training transfers - Company commander rating, Education, Expulsions, Arrests, and Average weekly test grade. The multiple correlation of these variables (in the validation sample) was .363. The predictor composite cross-validated with an  $r$  of .353, yielding a standard error of estimate of .3949.

The beta weights and the significance levels of the variables comprising the prediction equations for the airmen and non-airmen groups are listed in Table 8.

The difference between the standard error of estimate for airmen and the standard error of estimate for non-airmen is not statistically significant ( $t=1.016$ ). This indicates that predictions of effectiveness for airmen are no more or less accurate than predictions of effectiveness for non-airmen.

Five of the variables comprising the equation for predicting effectiveness for airmen are the same as those contained in the equation for the non-airmen. Their beta weights are of the same relative magnitude too. This would suggest that assignment to the aviation speciality does not moderate the effectiveness predictions.

As a final check on this conclusion, the equation derived from the validation sample of one group was used to predict effectiveness for the cross-validation sample of the other. If it were found that predictions for both groups were significantly less valid using the equations derived from the validation samples of the alternate group, then it would be reasonable to conclude that assignment to the aviation specialty is a unique contributor to the prediction of effectiveness. The results obtained, however, were these:

Table 5

Linearization Weights Assigned to Segments of Predictor Variables Significantly  
Related to Effectiveness Criterion -  
Airmen Group - Validation Sample

| <u>Variable</u>                               | <u>Segment</u>  | <u>Weight Assigned</u>        |
|---|---|-------------------------------|
| 1. Age  | Treated as Continuous Variable  |                               |
| 2. Active Duty<br>Obligation                  | 2 years<br>3 years (Minority)<br>4-6 years  | .864<br>.722<br>.840          |
| 3. Education                                  | 8 years or less<br>9-10 years<br>11 years<br>12 years or more   | .615<br>.678<br>.772<br>.907  |
| 4. School Grades<br>Failed                    | None<br>One<br>Two or more  | .844<br>.746<br>.648          |
| 5. School Grade<br>Average                    | A (4.0)<br>B (3.0)<br>C or less (2.0-)  | .958<br>.859<br>.744          |
| 6. Age Left<br>School                         | 13-16 years<br>17 years<br>18-20 years<br>21 years or older   | .659<br>.798<br>.869<br>1.000 |
| 7. Number of<br>Expulsions and<br>Suspensions | None<br>One<br>Two or More  | .827<br>.730<br>.627          |
| 8. Number of<br>Arrests                       | None<br>One or More   | .816<br>.676                  |
| 9. AFQT                                       | Treated as Continuous Variable  |                               |
| 10. GCT                                       | Treated as Continuous Variable  |                               |
| 11. ARI                                       | Treated as Continuous Variable  |                               |
| 12. MECH                                      | Treated as Continuous Variable  |                               |
| 13. CLER                                      | 0-34<br>35-49<br>50 or Higher   | .558<br>.773<br>.846          |
| 14. R.T. Transfers -<br>C.C. Rating           | 0 Transfers, CC Upper Ten<br>0 Transfers, CC Average<br>[0 Transfers, CC Lower Ten]<br>[1 or 2 Transfers ]<br>3 or More Transfers | .874<br>.830<br>.687<br>.313  |
| 15. Average Weekly<br>Test Grade              | Treated as Continuous Variable  |                               |
| 16. RFATS                                     | Treated as Continuous Variable  |                               |
| 17. Recruit<br>Discipline                     | No<br>Yes   | .797<br>.615                  |

Table 6<sup>a,b</sup>

Product-Moment Correlations of Predictors Significantly Related to Military Effectiveness - Non-Airmen  
Group - Validation Sample (N=3937)

| Variables                   | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> | <u>6</u> | <u>7</u> | <u>8</u> | <u>9</u> | <u>10</u> | <u>11</u> | <u>12</u> | <u>13</u> | <u>14</u> | <u>15</u> | <u>16</u> | <u>17</u> |
|-----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1. Effectiveness            |          |          |          |          |          |          |          |          |          |           |           |           |           |           |           |           |           |
| 2. Age                      | 157      |          |          |          |          |          |          |          |          |           |           |           |           |           |           |           |           |
| 3. Active Duty Ob.          | 144      | 913      |          |          |          |          |          |          |          |           |           |           |           |           |           |           |           |
| 4. Education                | 271      | 505      | 450      |          |          |          |          |          |          |           |           |           |           |           |           |           |           |
| 5. School Grds. Failed      | 111      | 141      | 106      | 477      |          |          |          |          |          |           |           |           |           |           |           |           |           |
| 6. School Grade Av.         | 112      | 131      | 118      | 267      | 221      |          |          |          |          |           |           |           |           |           |           |           |           |
| 7. Age left School          | 199      | 556      | 512      | 632      | 153      | 157      |          |          |          |           |           |           |           |           |           |           |           |
| 8. No. Expulsions           | 175      | 171      | 140      | 205      | 129      | 134      | 163      |          |          |           |           |           |           |           |           |           |           |
| 9. No. Arrests              | 128      | 094      | 090      | 149      | 032      | 092      | 139      | 240      |          |           |           |           |           |           |           |           |           |
| 10. AFQT                    | 154      | 119      | 096      | 348      | 247      | 182      | 222      | 017      |          |           |           |           |           |           |           |           |           |
| 11. GCT                     | 137      | 134      | 090      | 424      | 319      | 219      | 241      | 031      | 011      |           |           |           |           |           |           |           |           |
| 12. ARI                     | 165      | 108      | 067      | 395      | 293      | 276      | 259      | 055      | 060      | 672       |           |           |           |           |           |           |           |
| 13. MECH                    | 141      | 108      | 068      | 166      | 092      | 029      | 127      | 039      | -009     | 592       | 626       |           |           |           |           |           |           |
| 14. CLER                    | 141      | 123      | 097      | 288      | 195      | 131      | 208      | 036      | 050      | 567       | 365       | 285       |           |           |           |           |           |
| 15. R.T. Transfers          | 230      | 169      | 138      | 246      | 165      | 165      | 154      | 104      | 075      | 219       | 236       | 373       | 094       |           |           |           |           |
| 16. C.C. Rating             |          |          |          |          |          |          |          |          |          | 177       | 199       | 214       | 142       | 162       |           |           |           |
| 17. Aver. Weekly Test Grade | 204      | 164      | 123      | 377      | 279      | 216      | 223      | 059      | 036      | 542       | 649       | 501       | 349       | 252       | 327       |           |           |
| 18. RFATS                   | 113      | 138      | 100      | 306      | 307      | 120      | 182      | 024      | -040     | 480       | 530       | 366       | 370       | 241       | 131       | 515       |           |
| R. Discipline Status        | 140      | 097      | 069      | 114      | 083      | 056      | 099      | 095      | 024      | 044       | 057       | 067       | 061       | 068       | 338       | 110       | 146       |

<sup>a</sup>Decimal points have been omitted from the correlations.

<sup>b</sup>The validities of all the predictors are positive because some of the variables have been linearized with the effectiveness criterion. Refer to Table 7 for the weights assigned to the segments of the linearized variables.



Table 7

Linearization Weights Assigned to Segments of Predictor Variables Significantly  
Related to Effectiveness Criterion -  
Non-Airmen Group - Validation Sample

| <u>Variable</u>                            | <u>Segment</u>   | <u>Weight Assigned</u> |
|--|--|------------------------|
| 1. Age                                     | 17 years   | .695                   |
|  | 18 years or older                                      | .828                   |
| 2. Active Duty<br>Obligation               | 3 years (Minority)                                     | .699                   |
|  | 2,4, or 6 years  | .822                   |
| 3. Education                               | 9 years or less  | .633                   |
|  | 10 years   | .674                   |
|  | 11 years   | .729                   |
|  | 12 years or more                                       | .894                   |
| 4. School Grades<br>Failed                 | None   | .810                   |
|  | One  | .728                   |
|  | Two or more  | .692                   |
| 5. School Grade<br>Average                 | A-B (4.0-3.0)  | .824                   |
|  | C (2.0)  | .755                   |
|  | D or less (1.0-)                                       | .662                   |
| 6. Age Left<br>School                      | 13-16 years  | .635                   |
|  | 17 years   | .781                   |
|  | 18 years or older                                      | .857                   |
| 7. Number of Expulsions and<br>Suspensions | None   | .803                   |
|  | One  | .732                   |
|  | Two-Three  | .575                   |
|  | Four or more   | .463                   |
| 8. Number of Arrests                       | None   | .793                   |
|  | One-Two  | .694                   |
|  | Three or more  | .486                   |
| 9. AFQT                                    | Treated as Continuous Variable                         |                        |
| 10. GCT                                    | Treated as Continuous Variable                         |                        |
| 11. ARI                                    | Treated as Continuous Variable                         |                        |
| 12. MECH                                   | Treated as Continuous Variable                         |                        |
| 13. CLER                                   | 0-34   | .618                   |
|  | 35-44  | .729                   |
|  | 45-49  | .766                   |
|  | 50-54  | .804                   |
|  | 55 or higher   | .860                   |
| 14. R.T. Transfers-<br>C.C. Rating         | 0 Transfers, CC Upper Ten                              | .880                   |
|  | 0 Transfers, CC Average                                | .807                   |
|  | [0 Transfers, CC Lower Ten]<br>[ 1,2, or 3 Transfers ] | .660                   |
|  | 4 Transfers  | .415                   |
|  | 5 or More Transfers                                    | .229                   |
| 15. Average Weekly<br>Test Grade           | Treated as Continuous Variable                         |                        |
| 16. RFATS                                  | Treated as Continuous Variable                         |                        |

Table 7 (Continued)

|     | <u>Variable</u> | <u>Segment</u> | <u>Weight Assigned</u> |
|-----|-----------------|----------------|------------------------|
| 17. | Recruit         | None           | .782                   |
|     | Discipline      | Warning        | .646                   |
|     |                 | Action Taken   | .483                   |

(a) When the non-airmen equation was used to predict effectiveness for airmen, the  $r$  obtained was .338. In contrast, a correlation of only .328 was obtained on cross-validation for airmen using the airmen formula.

(b) When the airmen equation was used to predict effectiveness for non-airmen, an  $r$  of .343 was obtained. This was less than the  $r$  of .353 obtained by cross-validating the non-airmen equation on the non-airmen group.

In other words, the most valid prediction of effectiveness for both groups was made when the formula derived from the non-airmen sample was utilized. It is probable that this result was obtained because of the larger N-count in the non-airmen group, lending greater stability to the weights of the variables in that equation.

Table 8

## Predicted Effectiveness Equations for Airmen and Non-Airmen

| <u>Group</u> | <u>Predictor</u>               | <u>Beta Weight</u> | <u>Significance</u> | <u>Multiple Correlation</u> | <u>Cross Validity</u> |
|--------------|--------------------------------|--------------------|---------------------|-----------------------------|-----------------------|
| Airmen       | ARI                            | .1031              | $p < .01$           | .379                        | .328                  |
|              | R.T. Transfers-<br>C.C. Rating | .1770              | $p < .001$          |                             |                       |
|              | Education                      | .1378              | $p < .001$          |                             |                       |
|              | Expulsions                     | .0851              | $p < .01$           |                             |                       |
|              | Arrests                        | .0670              | $p = .02$           |                             |                       |
|              | Average Weekly<br>Test Grade   | .0655              | $p = .04$           |                             |                       |
| Non-Airmen   | MECH                           | .0670              | $p < .001$          | .363                        | .353                  |
|              | CLER                           | .0444              | $p < .01$           |                             |                       |
|              | R. Discipline                  | .0563              | $p < .001$          |                             |                       |
|              | R.T. Transfers-<br>C.C. Rating | .1216              | $p < .001$          |                             |                       |
|              | Education                      | .1596              | $p < .001$          |                             |                       |
|              | Expulsions                     | .1009              | $p < .001$          |                             |                       |
|              | Arrests                        | .0664              | $p < .001$          |                             |                       |
|              | Average Weekly<br>Test Grade   | .0549              | $p < .01$           |                             |                       |

## Discussion

The major purpose of this investigation was to evaluate whether occupational specialty, at least for airmen, might act as a moderator of the military effectiveness predictions of Navy enlisted personnel. Formulae were derived for forecasting the effectiveness of enlistees in aviation specialties and those not in aviation specialties. Predictions of the effectiveness of airmen were found to be no more valid when made on the basis of variables uniquely related to airmen effectiveness than when made on the basis of variables uniquely related to non-airmen effectiveness. The conclusion to be drawn from this finding is that membership in the group of aviation specialties is not a moderator of effectiveness predictions. Indeed, it is not even a unique contributor to effectiveness predictions.

The above finding is possibly explainable on the basis of the heterogeneity of duties performed by airmen and the diversity of physical environments in which airmen serve. In other words, although airmen are unique in the sense that they are involved with aircraft, as a group they perform a wide variety of duties which are not unlike those performed by non-aviation personnel. Medical and dental specialists, on the other hand, perform duties and serve in physical environments quite unlike those of other occupational groups. If enlistee occupation can in fact moderate effectiveness predictions, perhaps it would be more readily identifiable among groups such as corpsmen, dental technicians or stewards.

The findings of this study would also suggest that airmen have a higher rate of military effectiveness than non-airmen, not because of their occupational specialty nor because of the environment in which they serve, but because they are selected on the basis of those characteristics which are predictive of successful adaptation and performance (GCT, ARI, MECH, etc.). Were they to serve in non-aviation specialties, they would also have rates of effectiveness higher than the average enlistee.

The results of this study should probably be interpreted with some caution. The characteristics of enlistees who have entered the Navy since 1965 are markedly different from those of enlistees who entered service at the time the data were collected for this study. For example, sailors who have only recently enlisted have higher mean basic battery scores and have gone further in school than those personnel who entered service in 1960. As a result, the rate of military effectiveness of enlistees presently serving in their first enlistments is probably considerably higher than it was five to ten years ago.

### Summary

Two groups of enlistees (airmen and non-airmen, totaling 10,369 subjects) who entered the naval service in 1960 were compared on the basis of biographical data, cognitive test scores, recruit training performance, and fleet effectiveness during their first enlistments. Formulae were derived for predicting effectiveness for both groups separately in order to ascertain whether occupational assignment might have a moderating effect upon the validities obtained. The major findings were these:

(1) Airmen have a significantly higher rate of effectiveness than non-airmen, although the difference between the groups is not large.

(2) Reenlistment rates and the percentage of subjects attending service schools are approximately the same for the two groups.

(3) As a group, airmen possess higher cognitive abilities than non-airmen and more frequently give a history of prior military service.

(4) Assignment to the aviation specialty does not have the effect of moderating predictions of military effectiveness.

## References

Department of the Navy, Bureau of Naval Personnel.

Manual of Qualifications For Advancement in Rating,

NAVPERS 18068B. U. S. Government Printing Office, 1965.

Plag, J. A. The practical value of a psychiatric screening interview in predicting military ineffectiveness. Navy Medical Neuropsychiatric Research Unit, San Diego, California, Rep. No. 64-7, 1964.

Plag, J. A. and Goffman, J. M. The prediction of four-year military effectiveness from characteristics of naval recruits. Military Medicine, 1966, 131 (8), 729-735.

Plag, J. A. and Goffman, J. M. A formula for predicting effectiveness in the Navy from Characteristics of high school students. Psychology in the Schools, 1966, III (3), 216-221.

Plag, J. A. and Goffman, J. M. The Armed Forces Qualification Test: its validity in predicting military effectiveness for naval enlistees. Personnel Psychology, 1967, 20 (3), 323-340.

Plag, J. A. and Goffman, J. M. Fleet effectiveness prediction studies at a recruit training command. Naval Research Reviews, 1968, June, 18-25.

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